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Novel Plastic-Based Nano-Materials for Energy Sustainability

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Bio: Natalie Stingelin is a Full Professor at the Georgia Institute of Technology and the Chair of the School of Materials Science & Engineering. She held prior positions at Imperial College London and Queen Mary University of London, UK; the Philips Research Laboratories in Eindhoven, The Netherlands; the Cavendish Laboratories, University of Cambridge, UK; and the Swiss Federal Institute of Technology (ETH) Zürich, Switzerland. She is the Director of Georgia Tech's Center of Organic Electronics and Photonics, and was elected a 2023 Member of the European Academy of Sciences (EurASc); a 2021 Fellow of the U.S. National Academy of Inventors (NAI); a 2019 Fellow of the Materials Research Society (MRS); and a 2012 Fellow of the Royal Society of Chemistry (RSC). Her research interests encompass the broad area of functional polymer materials, polymer physics, hybrid nanomaterials, organic electronics / photonics, and bioelectronics.

Abstract: With seabirds trapped in multipack drink-packaging and the appearance of mid-ocean islands of indestructible rubbish, the idea that plastics could play a big part in our future might seem far-fetched. However, new, smart plastic-based nanomaterials may yet rescue the reputation of this all-consuming 20th century product. Research into 'cool' nanomaterials produced from plastics, e.g., for applications in the automotive industry and for building integration, could reduce the need for air conditioning and, thus, improve energy efficiency. We will present recent efforts to design novel nano-systems of desired optical functions targeted for a greener world, and illustrate their versatility. For example, they can offer the same flexibility, straight-forward processing and light weight as commodity plastics but these materials can control the flow of light and heat similar to inorganic matter. Their potential is discussed for their use in energy management in buildings and greenhouses in the form of heat mirrors; in photovoltaic applications when used as anti-reflection coatings and semi-transparent mirrors; or building blocks for novel optical structures that can lead to quantum devices – highlighting the overall promise of such nano-systems.